

March 31, 2009

Kelly Madalinski
Port of Portland
121 N.W. Everett Street
Portland, Oregon 97208

Re: OU2 Riverbank Soil Sampling and Pipe Abandonment
Swan Island Upland Facility
Portland, Oregon
ECSI No. 271
1115

Dear Mr. Madalinski:

This letter describes the riverbank soil sampling and outfall pipe removal activities completed at the Swan Island Upland Facility, Operable Unit 2 (OU2) (the Facility; Figure 1). The Port of Portland (Port) has entered into a voluntary agreement for remedial investigation, source control measures, and feasibility study with the Oregon Department of Environmental Quality (DEQ) for the Facility. In a letter dated September 5, 2008, the DEQ approved the following scope of work (presented in a letter dated August 12, 2008):

- Soil sampling beneath outfalls with an invert elevation above the ordinary line of high water (OLHW) including one active outfall (WR-399) and three inactive outfalls (CG-26, CG-27, and WR-159a); and
- Physical abandonment of the inactive outfalls.

These activities were completed in support of the Source Control Evaluation (SCE) for the site. The methods, procedures, and results of the chemical analyses are presented in this letter.

Background

OU2 consists of approximately 12 acres of upland located along N. Channel Avenue on the west side of Swan Island. OU2 is currently owned by the Port. OU2 was formerly referred to as the North Channel Avenue Fabrication Site but is currently leased in two separate parcels to Rinker/CEMEX for asphalt and concrete operations, and Daimler for truck and trailer parking (Figure 2). There are currently no structures or buildings on OU2 with the exception of a small building on the eastern boundary (Building 83).

Following is a discussion of the storm water outfall pipes at the Facility (Figure 3).

- Active Storm Water Pipes. Two active storm water outfalls (WR-163 and WR-399) are present on the Facility. Outfall WR-399 conveys storm water from a series of catch basins from the parking lot designated as OU4 (now owned by Cascade General/Vigor who is responsible for future storm water activities). Outfall WR-163 conveys storm water from an unpaved area on the southern extent of OU2.
- Removal of Historical Pipes (August 2006). Three storm water pipes (WR-159, -160, and -164) were removed from the Facility in August 2006 (ACA, 2007). These were shallow pipes (less than 2 feet below the ground surface [bgs]) that discharged near the top of the riverbank (and above OLHW). These pipes were installed by the Atlantic Richfield Company (ARCO) in the late 1980s to drain upland areas where water tended to accumulate during periods of high rainfall (Bridgewater, 2006). The pipes were capped when ARCO ceased its module fabrication operations in 1990. During the abandonment, the pipes were exposed with a small excavator, removed, and sent to a scrap yard for recycling. Riverbank soil sampling was completed below the end of each former storm water pipe location in September 2006 (Bridgewater, 2007). The analytical results are discussed as part of the overall data interpretation below.
- Identification of Additional Pipes (October 2007). The Port identified three inactive outfall pipes (CG-26, CG-27, and WR-159a; Photographs 1 through 3, respectively; Attachment A) in October 2007 during a concurrent boat and land reconnaissance conducted with Integral. Integral was working on an update to the City of Portland's Geographic Information System (GIS) database. WR-159a was subsequently designated WR-473 by the City in the recent update to the City GIS layer, but the WR-159a designation was retained for consistency. The results of the reconnaissance activities and historical research were transmitted to the DEQ in a letter dated February 13, 2008. It is unclear whether inactive outfall pipes CG-26 and CG-27 historically drained areas on OU2, or whether they were connected to drainage points along N. Channel Avenue (or facilities north of N. Channel Avenue), or even drainage points that may have been associated with U.S. Maritime Commission-related shipyard operations. It is possible that these outfalls do not belong to the Port. The historical research suggested that WR-159a is likely a former combined sanitary and storm sewer identified on a 1942 site plan (ACA, 2008).

Site Activities

Preparatory Activities

The following activities were completed in preparation for the field work:

- Health and Safety Plan (HASP). Ash Creek Associates, Inc. (ACA) prepared a HASP for its personnel involved with the project. The HASP was available to the subcontractors who supported the field activities.
- Utility Location. An underground utility locate was conducted by Port personnel prior to performing the subsurface work. A public utility locate request was also submitted to the Oregon Utility Notification Center.
- Work in Tenant Areas. The work activities associated with outfall WR-159a were conducted in coordination with Rinker/CEMEX.
- Work in Areas off Port Property. Access to outfall WR-399 and inactive outfall pipes CG-26 and CG-27 was conducted in coordination with Cascade General/Vigor.
- Coordination with Port Surveying. The ordinary line of low water (OLLW) and OLHW were surveyed and staked at each outfall (a typical location is shown on Photographs 4 and 5).

An additional pipe located below the OLHW was identified during the Port utility locate (Figure 3; Photograph 6). The pipe was designated CG-28. The outfall is an inactive, 24-inch corrugated pipe.

Riverbank Soil Sampling

ACA collected riverbank soil samples at outfall WR-399 and inactive outfall pipes CG-26, CG-27, and WR-159a (Figure 3) on October 1, 2008. The invert elevation of WR-163 is below the OLHW and will be evaluated in the SCE for OU2. Three soil samples were collected from the riverbank below each outfall consistent with the approach previously used at the three pipes that were removed by the Port in 2006 (i.e., outfalls WR-159, -160 and -164). The samples were collected in accordance with Standard Operating Procedures (SOPs) -2.1 and -2.2 (Attachment B). The samples were labeled "a", "b", and "c". The "a" sample was collected near the top of the riverbank just below the end of the outfall. The "c" sample was collected at an elevation corresponding to OLLW, or approximately 1 to 2 feet above the river, whichever was higher. The "b" sample was collected approximately halfway down the riverbank between the "a" and "c" samples.

Aliquots of each "a", "b", and "c" sample were combined in the field to create a single composite sample for each outfall. The discrete samples were also retained.

Pipe Removal

Terra Hydr, Inc. abandoned the pipes at inactive outfall pipes WR-159a, CG-26, and CG-27 on October 2, 2008 (under subcontract to ACA) per the following procedure (with photographs showing a typical location):

- Excavate the bank around outfall exposing approximately 5 feet of pipe (Photograph 7);
- Cut off pipe using oxygen-acetylene cutting torch;
- Plug pipe with non-shrinking cement grout (Photograph 8); and
- Backfill the excavation with native material (Photograph 9).

Following are details regarding access and specific observations made at each outfall.

- Inactive Outfall Pipe WR-159a. Accessed through a Port gate from the Rinker/CEMEX leasehold. The outfall was a 16-inch, straight steel pipe. The pipe was cut and plugged.
- Inactive Outfall Pipe CG-26. Accessed via Cascade General/Vigor service road. The excavation revealed that the pipe reduced from 18-inch to 12-inch corrugated approximately 5 feet into the bank (Photograph 10). The pipe was cut and plugged.
- Inactive Outfall Pipe CG-27. Accessed via a Cascade General/Vigor service road. The chain link fence was temporarily removed to provide access for the excavator. The outfall was an 18-inch corrugated pipe. While excavating to expose the pipe, the pipe dislodged from the riverbank in an approximately 6-foot section (Photograph 11). Additional excavation into the riverbank was completed but no further pipe could be located. The fence was restored to its original condition after the work was completed.

Analytical Results

The soil samples were submitted to Columbia Analytical Services, Inc. (CAS) in Kelso, Washington for chemical analysis. Copies of the laboratory reports are included in Attachment C (in CD-ROM format due to the length of the Level III deliverable report). The samples were analyzed on a standard turnaround time. A quality assurance review

of the data was completed. No qualifiers were attached to the data as a result of our review. The laboratory analytical results are included in Tables 1 through 6.

Because the inactive outfall WR-159a may have drained the same portion of OU2 as the three storm water pipes (WR-159, -160, and -164) that were removed in 2006, the composite sample collected at WR-159a was analyzed for the same constituents, including the following:

- Polychlorinated Biphenyls (PCBs) by EPA Method 8082;
- Polynuclear Aromatic Hydrocarbons (PAHs) by EPA Method 8270C-SIM;
- Metals by EPA 6000/7000 Series Methods (including antimony, arsenic, cadmium, chromium, copper, lead, nickel, silver, and zinc);
- Total Petroleum Hydrocarbons as gasoline (TPHg) by Northwest Method NWTPH-Gx; and
- Diesel- and oil-range TPH (TPHd and TPHo, respectively) by Northwest Method NWTPH-Dx (with silica gel cleanup).

The samples collected below the other three locations (i.e., WR-399, CG-26, and CG-27) were analyzed for PCBs, PAHs, metals (including aluminum, antimony, arsenic, cadmium, chromium, copper, lead, mercury, manganese, nickel, selenium, silver, and zinc), and phthalates by EPA Method 8270M-SIM; and TPHg, TPHd/TPHo, and tributyl tin (TBT) by the Krone Method.

The analytical data were screened against the screening level values (SLVs) in the Joint Source Control Strategy (JSCS) guidance document (DEQ/EPA 2005; screening criteria revised July 16, 2007). The primary objective of the JSCS is to identify and evaluate sources of chemicals that may impact the Willamette River (DEQ/EPA, 2005). Overall, the detected chemical concentrations are consistent with the results of the sampling completed in 2006.

TPH. TPHg was not detected above the method reporting limit (MRL). TPHd and TPHo were detected at a total concentration up to 420 milligrams per kilogram (mg/kg). There are no SLVs for petroleum hydrocarbons.

Metals. The detected concentrations of lead in composite samples RB-4 through RB-7 were above the SLV and, consequently, the discrete samples were analyzed. The majority of the discrete sample results were above the SLVs. The highest concentrations detected in the discrete samples were from the "b" location with lower concentrations in the "a" and "c" locations. The only exception was the discrete samples from RB-5, which decreased in concentration from "a" to "c". The remaining metals were detected in the composite samples below the SLVs.

PAHs. PAHs were detected at low concentrations and below the SLVs.

Phthalates. The phthalate results were below the MRLs or detected at low concentrations and below the SLVs.

PCBs. PCB Aroclors 1254 and 1260 were detected at low concentrations and below the SLVs. Aroclors 1254 and 1260 were summed for comparison to the total PCB SLVs, which exceeded the DEQ's very conservative bioaccumulative sediment SLV.

TBT. The detected concentrations of TBT in composite samples RB-4 through RB-6 were above the SLV and, consequently, the discrete samples were analyzed. The discrete sample results were above the SLVs. The concentrations from discrete samples from RB-5 and RB-6 decreased in concentration from "a" to "c". The highest concentration from RB-4 was detected in the discrete sample from the "b" location with lower concentrations in the "a" and "c" locations.

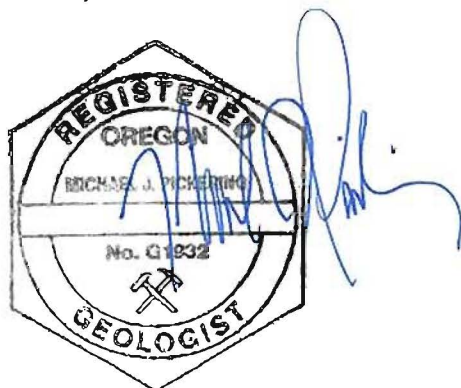
Summary and Conclusions

This letter described the riverbank soil sampling and outfall abandonment activities completed at the Facility. Outfalls with an invert elevation above the OLHW including one active outfall (WR-399) and three inactive outfalls (CG-26, CG-27, and WR-159a) were sampled, followed by physical abandonment of the inactive outfalls.

The detected concentrations are consistent with the results of the riverbank sampling completed in 2006. A few constituents exceeded the very conservative JSCS criteria. An exceedance of an SLV does not necessarily indicate an unacceptable risk to human or ecological receptors, but instead indicates that the chemical be considered further using a weight of evidence approach. The complete data set will be evaluated in the forthcoming SCE.

If you have any questions regarding these activities, please contact the undersigned at (503) 924-4704.

Sincerely,



Michael J. Pickering, R.G.
Associate Hydrogeologist

ATTACHMENTS:

- Table 1 – Soil Analytical Results: Total Petroleum Hydrocarbons
- Table 2 – Soil Analytical Results: Total Metals
- Table 3 – Soil Analytical Results: Polynuclear Aromatic Hydrocarbons
- Table 4 – Soil Analytical Results: Phthalates
- Table 5 – Soil Analytical Results: Polychlorinated Biphenyl Aroclors
- Table 6 – Soil Analytical Results: Tributyl Tin

- Figure 1 – Site Location Map
- Figure 2 – Site Vicinity Plan
- Figure 3 – Sampling and Pipe Removal Plan

- Attachment A – Photograph Log
- Attachment B – Standard Operating Procedures
- Attachment C – Analytical Laboratory Reports (Contained on CD-ROM)



References

- Ash Creek Associates, Inc. (ACA), 2007. Storm Water Piping Removal Oversight Memorandum, Swan Island Upland Facility, Portland, Oregon. June 22, 2007.
- Ash Creek Associates, Inc. (ACA), 2008. Memorandum entitled, "Outfalls, Swan Island Upland Facility – Operable Unit 2." February 13, 2008.
- Bridgewater, 2006. Operable Unit 2 Level I Ecological Risk Assessment – Swan Island Upland Facility. February 14, 2006.
- Bridgewater, 2007. Swan Island Upland Facility, Operable Unit 2 Supplemental Sampling Results. January 5, 2007.
- DEQ/EPA, 2005. Portland Harbor Joint Source Control Strategy – Final (Table 3-1 Updated July 16, 2007). December 2005.
- DEQ, 2008. Letter entitled, "Swan Island Upland Facility, ECSI No. 271." September 5, 2008
- Port of Portland, 2008. Letter entitled, "Swan Island Upland Facility, Operable Unit 2 Outfalls." August 12, 2008.

Table 1 - Soil Analytical Results: Total Petroleum Hydrocarbons
SIUF - OU2
Portland, Oregon

	2006 Sampling			2008 Sampling				
Outfall Pipe ID:	WR-164	WR-159	WR-160	WR-399	CG-26	CG-27	WR-159a	
Sample ID:	RB-1	RB-2	RB-3	RB-4	RB-5	RB-6	RB-7	
Sample Date:	Composite 9/26/2006	Composite 9/26/2006	Composite 9/26/2006	Composite 10/1/2008	Composite 10/1/2008	Composite 10/1/2008	Composite 10/1/2008	JSCS SLV
HCID (mg/kg)								
Gasoline	<20	<20	<20	--	--	--	--	--
Diesel	DET	<50	DET	--	--	--	--	--
Oil	DET	DET	DET	--	--	--	--	--
NWTPH-Gx (mg/kg)								
Gasoline	--	--	--	<5.5	<5.5	<6.2	<5.8	--
NWTPH-Dx (mg/kg)								
Diesel	76	28	100	41 H	3.2 J	5.9 J	14 J	--
Oil	450	230	820	380 O	27 J	75 J	130	--

Notes:

1. TPH-Gx = Gasoline-range Total Petroleum Hydrocarbons by Northwest Method NWTPH-Gx.
2. TPH-Dx = Diesel-range Total Petroleum Hydrocarbons by Northwest Method NWTPH-Dx (with silica gel cleanup).
3. HCID = Total Petroleum Hydrocarbons Identification by Northwest Method NWTPH-HCID.
4. mg/kg = Milligrams per kilogram (parts per million).
5. < = Not detected above the Method Reporting Limit (MRL).
6. DET = Detected above the MRL.
7. J = The result is an estimated concentration that is less than the MRL but greater than or equal to the Method Detection Limit (MDL).
8. JSCS SLV = Portland Harbor Joint Source Control Strategy Table 3-1: Screening Level Values for Soil/Storm Water Sediment (7/16/07 Revision).
9. -- = Not available or not analyzed.
10. H = The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
11. O = The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration pattern.

Table 2 - Soil Analytical Results: Total Metals

SIUF - OU2

Portland, Oregon

Outfall Pipe ID: Sample ID: Sample Date:	2006 Sampling			2008 Sampling								JSCS SLV
	WR-164 RB-1 Composite 9/26/2006	WR-159 RB-2 Composite 9/26/2006	WR-160 RB-3 Composite 9/26/2006	WR-399 RB-4 Composite 10/1/2008	WR-399 RB-4a 10/1/2008	WR-399 RB-4b 10/1/2008	WR-399 RB-4c 10/1/2008	CG-26 RB-5 Composite 10/1/2008	CG-26 RB-5a 10/1/2008	CG-26 RB-5b 10/1/2008	CG-26 RB-5c 10/1/2008	
Metals (mg/kg)												
Antimony	0.93	0.4	0.35	0.35	--	--	--	0.37	--	--	--	64
Arsenic	12.2	3.8	7	3.4	--	--	--	2.7	--	--	--	7
Cadmium	1.04	0.46	0.48	0.238	--	--	--	0.763	--	--	--	1
Chromium	29	19.9	22	13.6	--	--	--	13.8	--	--	--	111
Copper	271	92.4	96.3	65.9	--	--	--	33.3	--	--	--	149
Lead	85.6	43.2	36	41.3	27.2	170	91.4	20.1	30.1	15.2	6.94	17
Nickel	26.8	16.9	20.3	15.0	--	--	--	17.9	--	--	--	48.6
Silver	0.19	0.09	0.14	0.05	0.09	--	0.05	0.04	--	--	--	5
Zinc	835	174	264	153	--	--	--	246	--	--	--	459

Outfall Pipe ID: Sample ID: Sample Date:	2008 Sampling								JSCS SLV
	CG-27 RB-6 Composite 10/1/2008	CG-27 RB-6a 10/1/2008	CG-27 RB-6b 10/1/2008	CG-27 RB-6c 10/1/2008	WR-159a RB-7 Composite 10/1/2008	WR-159a RB-7a 10/1/2008	WR-159a RB-7b 10/1/2008	WR-159a RB-7c 10/1/2008	
Metals (mg/kg)									
Antimony	0.27	--	--	--	0.63	--	--	--	64
Arsenic	3.1	--	--	--	2.9	--	--	--	7
Cadmium	1.11	--	--	--	0.189	--	--	--	1
Chromium	14.9	--	--	--	22.9	--	--	--	111
Copper	57.7	--	--	--	71.3	--	--	--	149
Lead	42.6	58.2	87.5	33.6	57.5	84.2	104	18.5	17
Nickel	16.6	--	--	--	24.6	--	--	--	48.6
Silver	0.06	--	--	--	0.07	--	--	--	5
Zinc	359	--	--	--	121	--	--	--	459

Notes:

1. Metals analysis by EPA 6000/7000 Series Methods.
2. mg/kg = Milligrams per kilogram (parts per million).
3. JSCS SLV = Portland Harbor Joint Source Control Strategy Table 3-1: Screening Level Values for Soil/Storm Water Sediment (7/16/07 Revision).
4. Shading indicates that the reported concentration exceeds the screening level.

Table 3 - Soil Analytical Results: Polynuclear Aromatic Hydrocarbons

SIUF - OU2

Portland, Oregon

2006 Sampling													
Outfall Pipe ID:	WR-164 RB-1 Composite 9/26/2006	WR-164 RB-1a 9/26/2006	WR-164 RB-1b 9/26/2006	WR-164 RB-1c 9/26/2006	WR-159 RB-2 Composite 9/26/2006	WR-159 RB-2a 9/26/2006	WR-159 RB-2b 9/26/2006	WR-159 RB-2c 9/26/2006	WR-160 RB-3 Composite 9/26/2006	WR-160 RB-3a 9/26/2006	WR-160 RB-3b 9/26/2006	WR-160 RB-3c 9/26/2006	JSCS SLV
PAHs (µg/kg)													
Naphthalene	7.9	11	7.4	6.9	9.7	4.5	19	10	6.3	6.8	3.5	13	561
2-Methylnaphthalene	4	5.6	4	3.6	5.4	<2.6	11	5.4	3.5	4.8	<2.8	12	200
Acenaphthylene	41	28	34	28	61	19	84	33	16	15	8.8	23	200
Acenaphthene	<2.7	3.1	<2.7	2.9	5.1	<2.6	11	3.5	<2.8	<2.6	<2.8	17	300
Fluorene	<2.7	<2.8	<2.7	2.6	4.8	<2.6	9.2	2.8	<2.8	<2.6	<2.8	15	536
Dibenzofuran	<2.7	2.9	<2.7	2.7	3.3	<2.6	6.6	3.4	<2.8	4.3	<2.8	7.1	--
Phenanthrene	37	46	33	42	92	22	150	58	31	36	17	190	1,170
Anthracene	14	12	13	14	24	7.2	41	16	9.1	9	5.5	49	845
Fluoranthene	160	150	150	150	330	120	500	230	100	93	59	210	2,230
Pyrene	220	220	240	200	430	170	690	350	130	120	83	290	1,520
Benzo(b)fluoranthene	210	140	220	180	310	110	520	230	87	76	69	170	--
Benzo(k)fluoranthene	160	110	140	120	240	85	380	160	70	61	57	110	13,000
Benz(a)anthracene	68	61	69	63	140	50	230	110	45	36	40	110	1,050
Chrysene	160	120	160	140	260	95	430	190	82	69	62	210	1,290
Benzo(a)pyrene	170	140	180	150	320	130	520	230	94	79	64	180	1,450
Indeno(1,2,3-cd)pyrene	290	210	270	210	430	150	660	270	120	110	80	160	100
Dibenz(a,h)anthracene	22	21	30	25	34	15	77	36	11	14	14	35	1,300
Benzo(g,h,i)perylene	360	260	330	260	490	180	720	330	150	130	87	190	300

2008 Sampling					JSCS SLV
Outfall Pipe ID:	WR-399 RB-4 Composite 10/1/2008	CG-26 RB-5 Composite 10/1/2008	CG-27 RB-6 Composite 10/1/2008	WR-159a RB-7 Composite 10/1/2008	
PAHs (µg/kg)					
Naphthalene	9.2	23	5.6	8.2	561
2-Methylnaphthalene	6.4	23	2.1 J	2.7 J	200
Acenaphthylene	1.8 J	2.2 J	2.0 J	4.1 J	200
Acenaphthene	8.9	0.87 J	1.2 J	0.69 J	300
Fluorene	7.6	0.68 J	0.93 J	0.91 J	536
Dibenzofuran	10	5.6	0.99 J	1.1 J	--
Phenanthrene	87	20	15	16	1,170
Anthracene	9.3	3.5 J	2.2 J	4.5 J	845
Fluoranthene	120	32	34	38	2,230
Pyrene	120	46	38	52	1,520
Benzo(b)fluoranthene	100	61	35	49	--
Benzo(k)fluoranthene	33	15	12	17	13,000
Benz(a)anthracene	45	23	17	22	1,050
Chrysene	79	27	26	35	1,290
Benzo(a)pyrene	70	42	29	43	1,450
Indeno(1,2,3-cd)pyrene	77	46	30	56	100
Dibenz(a,h)anthracene	15	21	5.7	12	1,300
Benzo(g,h,i)perylene	81	64	33	70	300

Please refer to notes at end of table.

Table 3 - Soil Analytical Results: Polynuclear Aromatic Hydrocarbons
SIUF - OU2
Portland, Oregon

Notes:

1. Polynuclear Aromatic Hydrocarbons (PAHs) by U.S. Environmental Protection Agency (EPA) Method 8270 C SIM.
2. $\mu\text{g/kg}$ = Micrograms per kilogram (parts per billion).
3. JSCS SLV = Portland Harbor Joint Source Control Strategy Table 3-1: Screening Level Values for Soil/Storm Water Sediment (7/16/07 Revision).
4. -- = Not available.
5. < = Not detected above the Method Reporting Limit (MRL).
6. Shading indicates that the reported concentration exceeds the screening level.
7. J = The result is an estimated concentration that is less than the MRL but greater than or equal to the Method Detection Limit (MDL).

Table 4 - Soil Analytical Results: Phthalates
SIUF - OU2
Portland, Oregon

		2008 Sampling				
Outfall Pipe ID:	WR-399	CG-26	CG-27	WR-159a	JSCS SLV	
Sample ID:	RB-4	RB-5	RB-6	RB-7		
Sample Date:	Composite 10/1/2008	Composite 10/1/2008	Composite 10/1/2008	Composite 10/1/2008		
Phthalates (µg/kg)						
Dimethyl Phthalate	<100	<10	<100	--	--	
Diethyl Phthalate	<100	2.1 J	<100	--	600	
Di-n-butyl Phthalate	<200	<20	<200	--	100	
Butyl Benzyl Phthalate	120 D	8.8 J	<100	--	--	
Bis(2-ethylhexyl) Phthalate	360 JD	30 J	81 JD	--	800	
Di-n-octyl Phthalate	<100	<10	<100	--	--	

Notes:

1. Phthalates by U.S. Environmental Protection Agency (EPA) Method 8270C.
2. µg/kg = Micrograms per kilogram (parts per billion).
3. JSCS SLV = Portland Harbor Joint Source Control Strategy Table 3-1: Screening Level Values for Soil/Storm Water Sediment (7/16/07 Revision).
4. -- = Not available.
5. < = Not detected above the Method Reporting Limit (MRL).
6. J = The result is an estimated concentration that is less than the MRL but greater than or equal to the Method Detection Limit (MDL).
7. D = The reported result is from a dilution.

Table 5 - Soil Analytical Results: Polychlorinated Biphenyl Aroclors
SIUF - OU2
Portland, Oregon

Outfall Pipe ID:	2006 Sampling			2008 Sampling				JSCS SLV
	WR-164 RB-1	WR-159 RB-2	WR-160 RB-3	WR-399 RB-4	CG-26 RB-5	CG-27 RB-6	WR-159a RB-7	
Sample ID:	Composite	Composite	Composite	Composite	Composite	Composite	Composite	
Sample Date:	9/26/2006	9/26/2006	9/26/2006	10/1/2008	10/1/2008	10/1/2008	10/1/2008	
PCBs (µg/kg)								
Aroclor 1016	<54	<52	<55	<10	<10	<10	<10	530
Aroclor 1221	<110	<110	<110	<20	<20 i	<20 i	<20	--
Aroclor 1232	<54	<52	<55	<10	<10 i	<10 i	<10	--
Aroclor 1242	<54	<52	<55	<10	<10 i	<10	<10	--
Aroclor 1248	<54	<52	<55	<10	<10 i	<10 i	<10	1,500
Aroclor 1254	<54	<52	<55	23	<10	<10	14 P	300
Aroclor 1260	72	77	<55	68	53	78	44	200
Aroclor 1262	--	--	--	<10	<10	<10	<10	--
Aroclor 1268	--	--	--	<10	<10	<10	<10	--
Total PCBs	99	103	55	91	58	83	58	0.39

Notes:

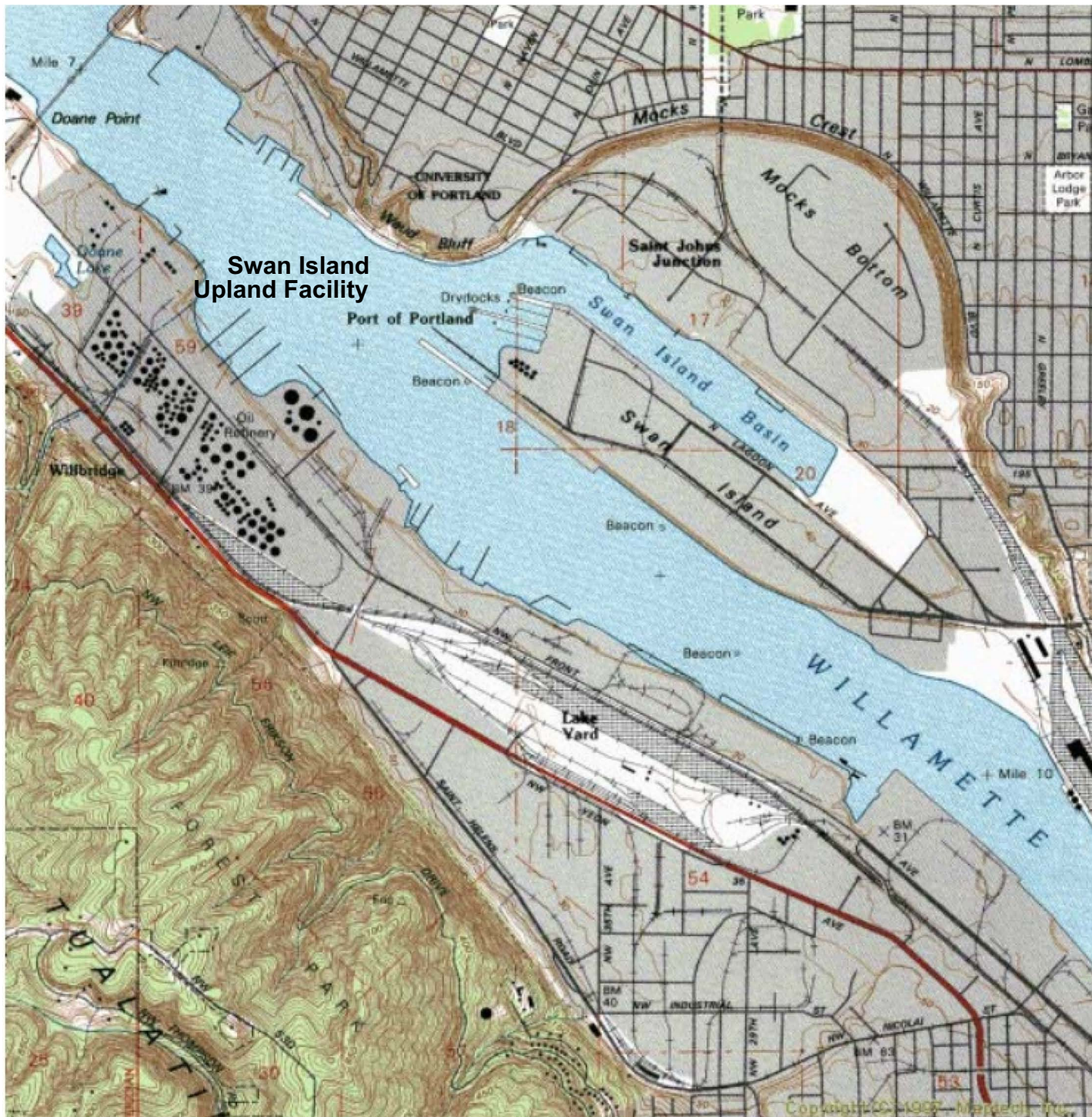
1. Polychlorinated Biphenyl (PCB) Aroclors by U.S. Environmental Protection Agency (EPA) Method 8082.
2. µg/kg = Micrograms per kilogram (parts per billion).
3. JSCS SLV = Portland Harbor Joint Source Control Strategy Table 3-1: Screening Level Values for Soil/Storm Water Sediment (7/16/07 Revision).
4. -- = Not available.
5. < = Not detected above the Method Reporting Limit (MRL).
6. Shading indicates that the reported concentration exceeds the screening level.
7. Total PCBs = Sum of the Aroclor 1254 and 1260 concentrations, using one-half the detection limit for samples with concentrations reported as not detected.
8. I = The MRL/Method Detection Limit (MDL) has been elevated due to chromatic interference.
9. P = The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40 percent between the two analytical results.

Table 6 - Soil Analytical Results: Tributyl Tin
SIUF - OU2
Portland, Oregon

	2008 Sampling													
Outfall Pipe ID:	WR-399	WR-399	WR-399	WR-399	CG-26	CG-26	CG-26	CG-26	CG-27	CG-27	CG-27	CG-27	WR-159a	
Sample ID:	RB-4				RB-5				RB-6				RB-7	
Sample Date:	Composite 10/1/2008	RB-4a 10/1/2008	RB-4b 10/1/2008	RB-4c 10/1/2008	Composite 10/1/2008	RB-5a 10/1/2008	RB-5b 10/1/2008	RB-5c 10/1/2008	Composite 10/1/2008	RB-6a 10/1/2008	RB-6b 10/1/2008	RB-6c 10/1/2008	Composite 10/1/2008	JSCS SLV
Tri-n-butyltin (µg/kg) TBT	130 D	67	580 D	< 5.0	17	32	<4.9	< 5.0	120	380 D	7.0	<4.9	--	2.3

Notes:

1. Tri-n-butyltin by Krone Method.
2. µg/kg = Micrograms per kilogram (parts per billion).
3. JSCS SLV = Portland Harbor Joint Source Control Strategy Table 3-1: Screening Level Values for Soil/Storm Water Sediment (7/16/07 Revision).
4. -- = Not available.
5. < = Not detected above the Method Reporting Limit (MRL).
6. Shading indicates that the reported concentration exceeds the screening level.
7. Total PCBs = Sum of the Aroclor 1254 and 1260 concentrations, using one-half the detection limit for samples with concentrations reported as not detected.
8. D = The reported result is from a dilution.



Base map prepared from USGS 7.5-minute quadrangles as provided by Topozone. (1990)

0 2000 4000

Scale in Feet



Portland

Site Location Map

OU2 Soil Sampling and Pipe Abandonment
Swan Island Upland Facility
Portland, Oregon



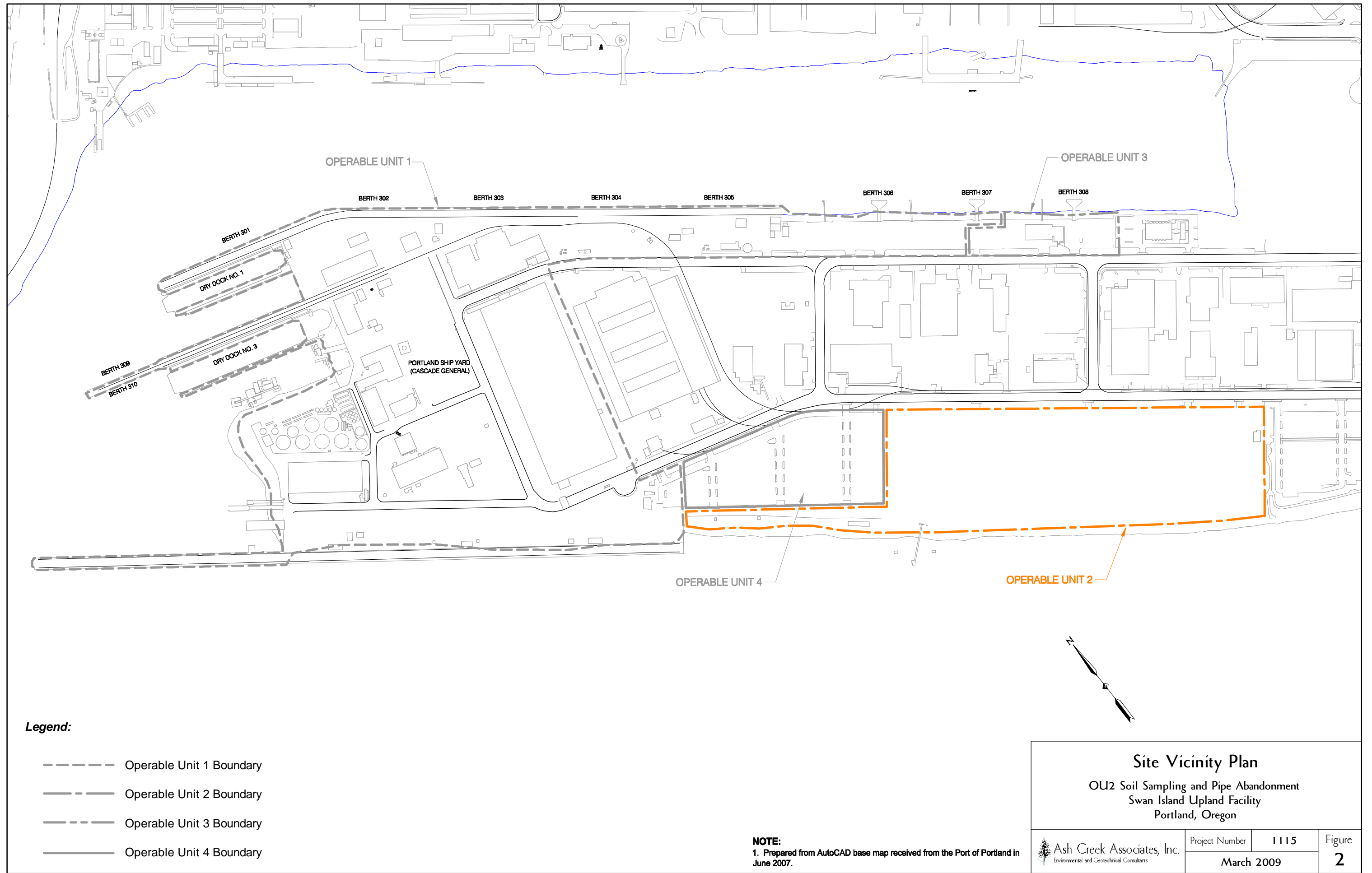
Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Project Number 1115

March 2009

Figure


1

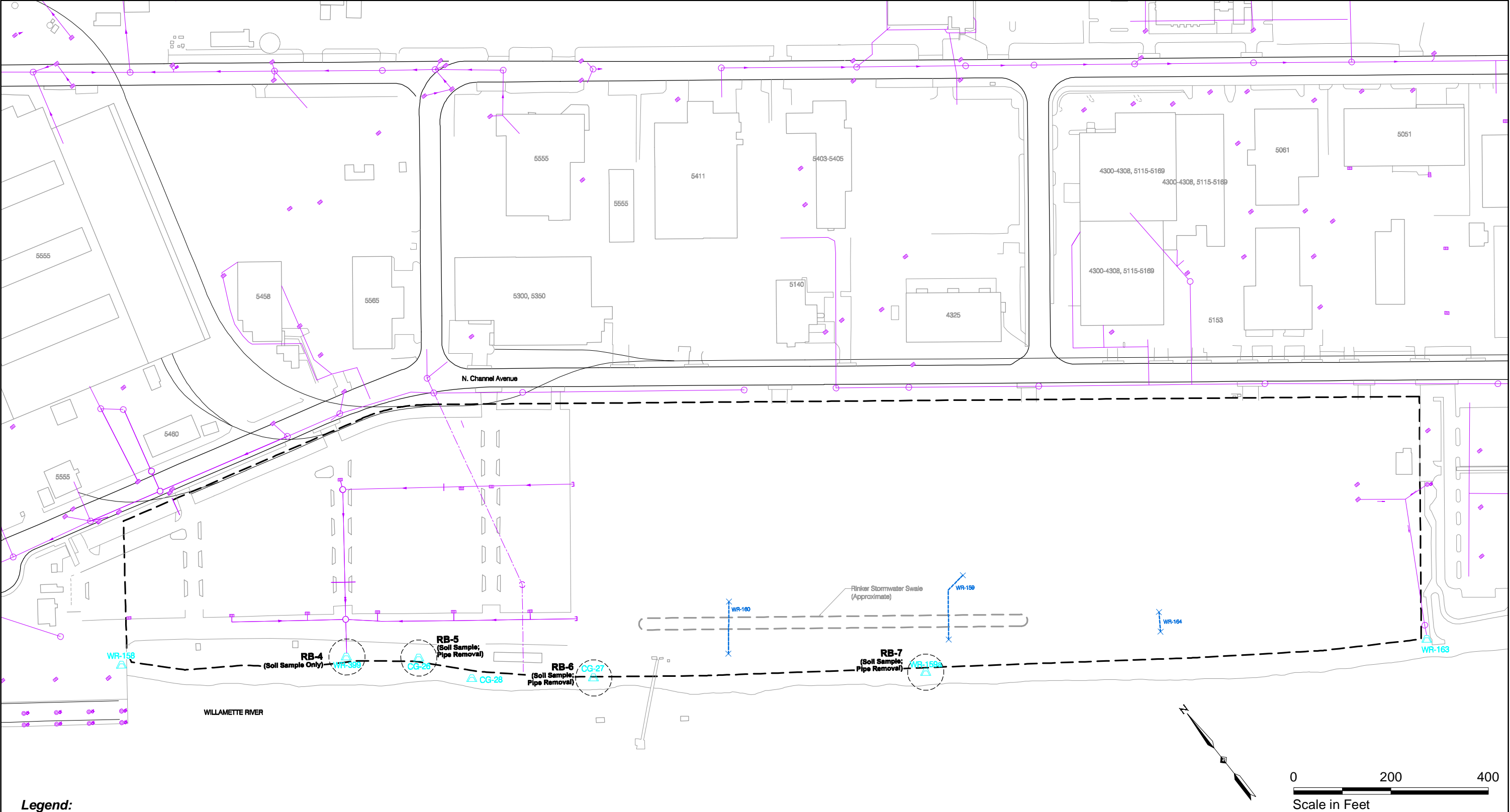


Legend:

- Operable Unit 1 Boundary
- Operable Unit 2 Boundary
- Operable Unit 3 Boundary
- Operable Unit 4 Boundary

NOTE:
1. Prepared from AutoCAD base map received from the Port of Portland in June 2007.

Site Vicinity Plan		
OU2 Soil Sampling and Pipe Abandonment Swan Island Upland Facility Portland, Oregon		
 Ash Creek Associates, Inc. <small>Environmental and Geotechnical Consultants</small>	Project Number	1115
	March 2009	
		Figure 2



Legend:

- RB-4 (Soil Sample Only) Soil Sample Location and (Action Taken)
- WR-399 Outfall Location and Designation
- Catch Basin Location
- Manhole Location
- Drain Location
- STS Location and Flow Direction (Port of Portland)

- WR-160 Storm Water Pipe Location and Designation (Abandoned July 2006)
- Historical STS (STS = Storm Sewer)
- Operable Unit 2 Boundary

NOTES:

1. Prepared from AutoCAD base map received from the Port of Portland in June 2007.
2. Outfall locations from Integral Consulting, Inc. GIS Export received by email on November 21, 2007. Outfall location CG-28 estimated with a hand-held global positioning system (GPS) device.
3. Outfall Riverbank Soil Samples: Three soil samples were collected from the riverbank below each outfall. The "a" sample was collected near the top of the riverbank just below the end of the outfall. The "c" sample was collected at an elevation corresponding to OLLW, or approximately one to two feet above the river, whichever was higher. The "b" sample was collected approximately halfway down the riverbank between the "a" and "c" samples.

Sampling and Pipe Removal Plan

OU2 Soil Sampling and Pipe Abandonment
Swan Island Upland Facility
Portland, Oregon

Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

Project Number 1115
March 2009

Figure 3



Attachment A

Photograph Log

ATTACHMENT A PHOTOGRAPH LOG

Project Name: OU2 Soil Sampling and Pipe Removal
Project Number: 1115

Client: Port of Portland
Location: Portland, Oregon

Photo No: 1	 A photograph of a rocky, sloping terrain under a clear blue sky. The foreground is covered with large, flat, grey rocks and some sparse green vegetation. A long, light-colored log lies horizontally across the middle ground. In the background, there is a hillside covered in dry, yellowish-brown grass and some small trees. A white circle is drawn around a dark, vertical object (the outfall pipe) on the hillside.
Photo Date: 9/29/08	
Orientation: Northeast	
Description: Outfall CG-26 (circled) with OLHW stake at sampling location RB-5a.	
Photo No: 2	 A photograph of a rocky, sloping terrain under a clear blue sky. The foreground is covered with large, flat, grey rocks and some sparse green vegetation. A long, light-colored log lies horizontally across the middle ground. In the background, there is a hillside covered in dry, yellowish-brown grass and some small trees. A white circle is drawn around a dark, vertical object (the outfall pipe) on the hillside.
Photo Date: 9/29/08	
Orientation: Northeast	
Description: Outfall CG-27 (circled) with OLHW stake at sampling location RB-6a.	

ATTACHMENT A PHOTOGRAPH LOG

Project Name: OU2 Soil Sampling and Pipe Removal
Project Number: 1115

Client: Port of Portland
Location: Portland, Oregon





Photo No: 3	
Photo Date: 9/29/08	
Orientation: Northeast	
Description: Outfall WR-159a (circled) with OLHW stake at sampling location RB-7a.	

Photo No: 4	
Photo Date: 9/29/08	
Orientation: Northeast	
Description: Outfall WR-159a with close-up of OLHW stake.	

ATTACHMENT A PHOTOGRAPH LOG

Project Name: OU2 Soil Sampling and Pipe Removal
Project Number: 1115



Client: Port of Portland
Location: Portland, Oregon

Photo No: 5	
Photo Date: 9/29/08	
Orientation: Southwest	
Description: OLLW stake at sampling location RB-7c.	
Photo No: 6	
Photo Date: 10/2/08	
Orientation: Northeast	
Description: Pipe CG-28 identified during the Port utility locate.	

ATTACHMENT A PHOTOGRAPH LOG

Project Name: OU2 Soil Sampling and Pipe Removal
Project Number: 1115

Client: Port of Portland
Location: Portland, Oregon


Photo No: 7	
Photo Date: 10/2/08	
Orientation: Northeast	
Description: Outfall WR-159a after excavation and pipe removal.	
Photo No: 8	
Photo Date: 10/2/08	
Orientation: North	
Description: Outfall WR-159a after plugging with non-shrink cement.	

ATTACHMENT A PHOTOGRAPH LOG

Project Name: OU2 Soil Sampling and Pipe Removal
Project Number: 1115

Client: Port of Portland
Location: Portland, Oregon

Photo No: 9	
Photo Date: 10/2/08	
Orientation: Northeast	
Description: Outfall WR-159a after backfill.	

Photo No: 10	
Photo Date: 10/2/08	
Orientation: Northeast	
Description: Outfall CG-26 after excavation. The excavation revealed that the pipe reduced from 18-inch to 12-inch corrugated approximately 5 feet into the bank.	

ATTACHMENT A PHOTOGRAPH LOG

Project Name: OU2 Soil Sampling and Pipe Removal
Project Number: 1115

Client: Port of Portland
Location: Portland, Oregon

Photo No: 11	
Photo Date: 10/2/08	
Orientation: Southwest	
Description: Section of pipe removed at Outfall CG-27.	

Attachment B

Standard Operating Procedures

1. PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) provides instructions for standard field screening. Field screening results are used to aid in the selection of soil samples for chemical analysis. This procedure is applicable during all Ash Creek Associates (ACA) soil sampling operations.

Standard field screening techniques include the use of a photoionization detector (PID) to assess for volatile organic compounds (VOCs), for the presence of petroleum hydrocarbons using a sheen test, and for non-aqueous phase liquids (NAPLs) using dyes and UV light. These methods will not detect all potential contaminants, so selection of screening techniques shall be based on an understanding of the site history. The PID is not compound or concentration-specific, but it can provide a qualitative indication of the presence of VOCs. PID measurements are affected by other field parameters such as temperature and soil moisture.

2. EQUIPMENT AND MATERIALS

The following materials are necessary for this procedure:

- PID with calibration gas
- Glass jars (with aluminum foil) or resealable bags
- NAPL Dye (such as OilScreen DNAPL-Lens) if needed for NAPL screening
- UV Light Box (if needed for NAPL screening)

3. METHODOLOGY

Each soil sample will be field screened for VOCs using a PID (with a 10.2 eV probe) and for the presence of petroleum hydrocarbons using a sheen test. If the presence of NAPLs is suspected, then screening using dye and UV light is also to be completed. The PID used on site will be calibrated on a daily basis according to the manufacturer's specifications. The PID is also used as a safety tool. The PID can be used to monitor air during activities where vapors may be present in the breathing space. Document all calibration activities and field observations per SOP 1.1. The field screening procedures are summarized below.

PID Calibration Procedure:

- Zero the PID using ambient air from the general area where the work will be done.
- A standard gas of 100 ppm isobutylene gas is then used to calibrate the PID. If questionable readings are encountered, the PID will be recalibrated using new 100 ppm isobutylene gas.

PID Screening Procedure:

- Place a representative portion (approximately one ounce) of freshly exposed, uncompacted soil into a clean resealable plastic bag or glass jar.
- Seal the bag or jar (with aluminum foil) and shake to expose vapors from the soil matrix.
- Allow the bag to sit to reach ambient temperature.
- Carefully insert the intake port of the PID into the plastic bag or jar.
- Record the sample concentration in the field notes.

Sheen Test Procedure:

- Following the PID screen, add enough water to the bag/jar to cover the sample.
- Observe the water surface for signs of discoloration/sheen and characterize.

No Sheen (NS)	No visible sheen on the water surface
Slight Sheen (SS)	Light, colorless, dull sheen, irregular spread, not rapid. Biological content may produce a slight sheen (typically platy/blocky).
Moderate Sheen (MS)	Light to heavy coverage, may have some color/iridescence, spread is irregular to flowing, few remaining areas of no sheen on water surface.
Heavy Sheen (HS)	Heavy sheen coverage with color/iridescence, spread is rapid, entire water surface may be covered with sheen.

NAPL Dye Procedure:

- Dye can be either liquid form, dissolvable tablet, or spray applied.
- Follow manufacturers instructions for specific product used.
- NAPL testing is completed after other field screening and sample collection is complete.
- For OilScreen DANPL-Lens dye, the remaining soil sample is sprayed along its length so the soil surface is visibly wetted. A royal blue color of the dye about one minute after spraying would be considered a positive indication of NAPL.

UV Light Screening Procedure:

- UV Light Screening involves placement of a portion of the soil sample into a resealable plastic bag (which can be the same as used for PID screening, but before sheen test is performed).
- The sample was then examined in a dark space under UV light using a small, portable UV light box.
- The plastic bag is manipulated during examination to squeeze fluid against the bag beneath the lamp.
- Fluorescence (glowing color) indicates presence of NAPLs.

1. PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) describes the methods used for obtaining surface soil samples for physical and/or chemical analysis. For purposes of this SOP, surface soil (including shallow subsurface soil) is loosely defined as soil that is present within 3 feet of the ground surface at the time of sampling. Various types of sampling equipment are used to collect surface soil samples including spoons, scoops, trowels, shovels, and hand augers.

2. EQUIPMENT AND MATERIALS

The following materials are necessary for this procedure:

- Spoons, scoops, trowels, shovels, and/or hand augers. Stainless steel is preferred.
- Stainless steel bowls
- Laboratory-supplied sample containers
- Field documentation materials
- Decontamination materials
- Personal protective equipment (as required by Health and Safety Plan)

3. METHODOLOGY

Project-specific requirements will generally dictate the preferred type of sampling equipment used at a particular site. The following parameters should be considered: sampling depth, soil density, soil moisture, use of analyses (e.g., chemical versus physical testing), type of analyses (e.g., volatile versus non-volatile). Analytical testing requirements will indicate sample volume requirements that also will influence the selection of the appropriate type of sampling tool. The project sampling plan should define the specific requirements for collection of surface soil samples at a particular site.

Collection of Samples

- **Volatile Analyses.** Surface soil sampling for volatile organics analysis (VOA) is different than other routine physical or chemical testing because of the potential loss of volatiles during sampling. To limit volatile loss, the soil sample must be obtained as quickly and as directly as possible. If a VOA sample is to be collected as part of a multiple analyte sample, the VOA sample portion will be obtained first. The VOA sample should be obtained from a discrete portion of the entire collected sample and should not be composited or homogenized. Sample bottles should be filled to capacity, with no headspace. Specific procedures for collecting VOA samples using the EPA Method 5035 are discussed in SOP 2-7.
- **Other Analyses.** Once the targeted sample interval has been collected, the soil sample will be thoroughly homogenized in a stainless steel bowl prior to bottling. Sample homogenizing is accomplished by manually mixing the entire soil sample in the stainless steel bowl with the sampling tool or with a clean teaspoon or spatula until a uniform mixture is achieved. If packing of the samples into the bottles is necessary, a clean stainless steel teaspoon or spatula may be used.

General Sampling Procedure:

- Decontaminate sampling equipment in accordance with the Sampling and Analysis Plan (SAP) before and after each individual soil sample.
- Remove surface debris that blocks access to the actual soil surface or loosen dense surface soils, such as those encountered in heavy traffic areas. If sampling equipment is used to remove surface debris,

the equipment should be decontaminated prior to sampling to reduce the potential for sample interferences.

- When using a hand auger, push and rotate downward until the auger becomes filled with soil. Usually a 6- to 12-inch long core of soil is obtained each time the auger is inserted. Once filled, remove the auger from the ground and empty into a stainless steel bowl. If a VOA sample is required, the sample should be taken directly from the auger using a teaspoon or spatula and/or directly filling the sample container from the auger. Repeat the augering process until the desired sample interval has been augered and placed into the stainless steel bowl.

Backfilling Sample Locations:

Backfill in accordance with federal and state regulations including OAR 690-240 (e.g., bentonite requirements). The soils from the excavation will be used as backfill unless project-specific or state requirements include the use of clean backfill material.

Attachment C

Analytical Laboratory Reports (Contained on CD-ROM)